



# INNOVATIVE CONCEPT IN MILITARY PACKAGING



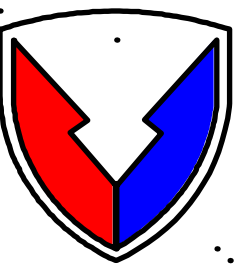
TENTH ANNUAL GOVT-INDUSTRY SHELF-LIFE SYMPOSIUM  
SAN DIEGO, CALIFORNIA  
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Presented by:

TACOM-ARDEC

Logistics Res. & Eng.  
Directorate

Picatinny Arsenal, N.J. 07806-  
5000



# INNOVATIVE CONCEPT IN MILITARY PACKAGING



**AMC**

## **BACKGROUND:**

- TACOM-ARDEC is recently reorganized. Packaging Division belongs to

Logistics Research & Engineering Directorate.

Packaging Division Capabilities:

- Design, Development using PRO-E, Finite Element Analysis, Probabilistic analysis
- Proto type manufacturing
- Testing
- Work request came from PM-AMMOLOG, Logistics R&D Activity.

Additional

seed money became available under a CRADA (US ARL- Adv Tech  
In ~~2002~~ Oct 03

South Carolina) to explore feasibility of using Vanadium micro



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## PROGRAM OBJECTIVES:

- Provide soldier with lighter, cost effective, environmental-friendly, reusable  
packaging configuration
- Improve outer packaging of M2A1 ammo container configuration
- Meet military packaging requirements
- Extend benefits to other packaging configurations



# INNOVATIVE CONCEPT IN MILITARY PACKAGING



## CONCEPT DESCRIPTION:

- Eliminate wire-bound wood box in M2A1 containers packaging
- Design/develop a metallic interface (thin gage, high strength alloyed steel) to protect M2A1 container during storage/transportation

## WORK SCOPE:

- Utilize Pro-E, finite element analysis to develop interface designs
- Adopt specific design for prototype production and testing
- Develop new precision forming tool
- involves scheduling/management of machine shop, contractor, steel producers, and technical professionals.

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## TEAM DESCRIPTION:

- TACOM-ARDEC Packaging & Engineering Support Division (Lead Responsibility)
- Machine shop (Picatinny), and BE Corporation (forming tool contractor)
- BWAY Corporation (Manufacturer of M2A1 ammo containers)
- Test Facility (ARDEC-Picatinny)
- AMMOLOG Logistics R&D Activity



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### PROGRAM ASSESSMENTS MADE IN:

- Technical
- Financial
- Environmental
- Manufacturing/Design
- Risk

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### **ACCOMPLISHMENTS ( April-August 03):**

- Several steel producers contacted. Note that thin gage (1/16") Vanadium-alloyed steel is a specialty item.
- Finite Element Analyses with Pro-E modeling completed
- Preliminary cost-benefit analysis performed
- Formability of thin gage (1/16") seems good (no fracture observed)
- Feasibility seems promising for a wide range of military ammo container applications
- Forming tool is in progress
- Prototype production and full-scope testing remain in the demonstration phase



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### CONCLUSIONS:

**Preliminary Observations** indicate Vanadium-alloyed steel provides:

- less cube and weight
- less deformation
- cost effective, environmental-friendly
- good formability and high strength

### **Recommendations:**

•to go forward with Vanadium-alloyed steel interface into the demonstration phase (prototype production, tests and detailed cost analysis). Utilize results to improve wide range of ammo containers and/or packaging configurations.





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## APPENDIX

### PHOTOGRAPH S:



**CURRENTLY- FIELDIED TWO M2A1 CONTAINERS  
IN A WIRE BOUND BOX**

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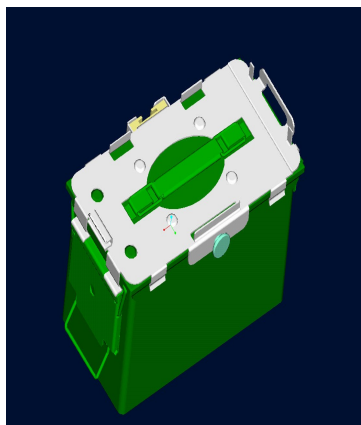


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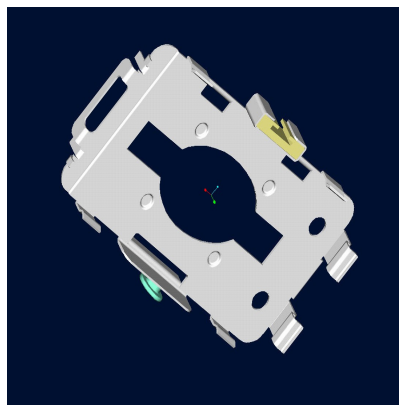


## APPENDIX

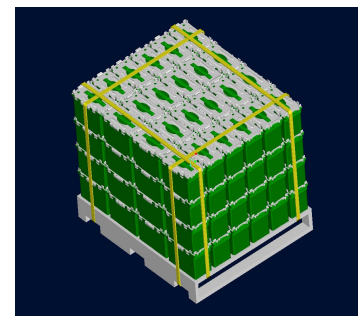
### PROPOSED INTERFACE - PALLETIZATION



Interface(white colored portion)  
of M2A1  
on top of M2A1 green colored  
container

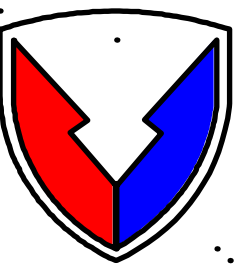


Underneath view  
of the interface



Palletization  
containers

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## APPENDIX

### AMC PRELIMINARY DROP RESULTS (FEA)

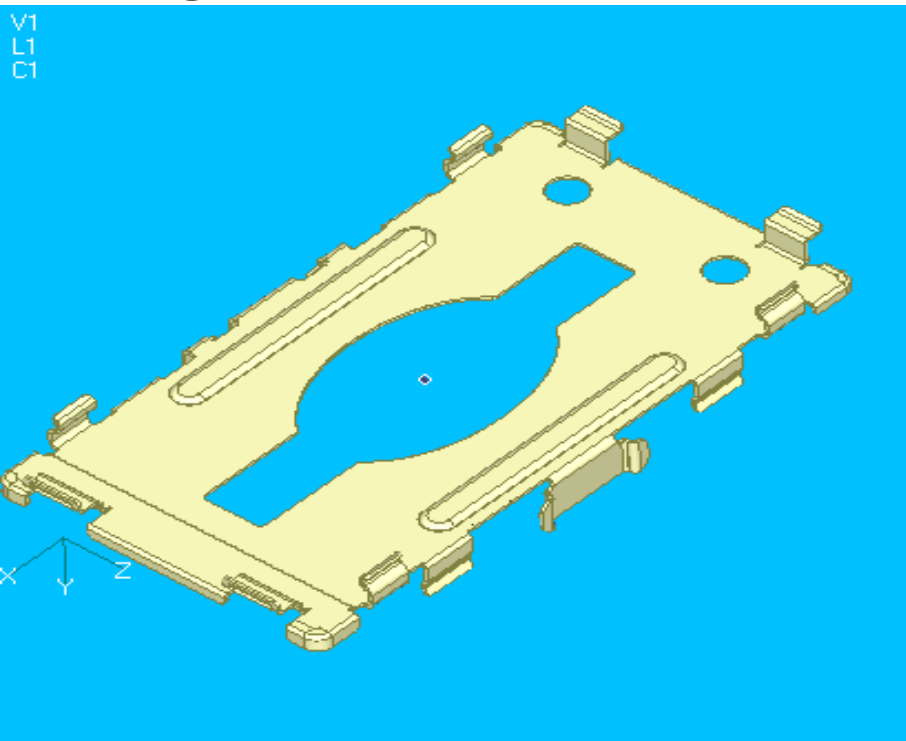
- Parametric FEA study performed.
- Deformation is the failure mechanism.
- Vanadium Steel reduces deformation between 15 – 90%

Case Study	Drop Orientation	Deformation (inches)		% reduction in Deformation
		Low Alloy Steel	Vanadium Steel	
1	45 Palletize	0.308	0.031	89.9
2	45 degree drop	0.805	0.679	15.7
3	Flat drop	0.0239	0.0171	28.5
4	Side drop	0.599	0.426	28.7

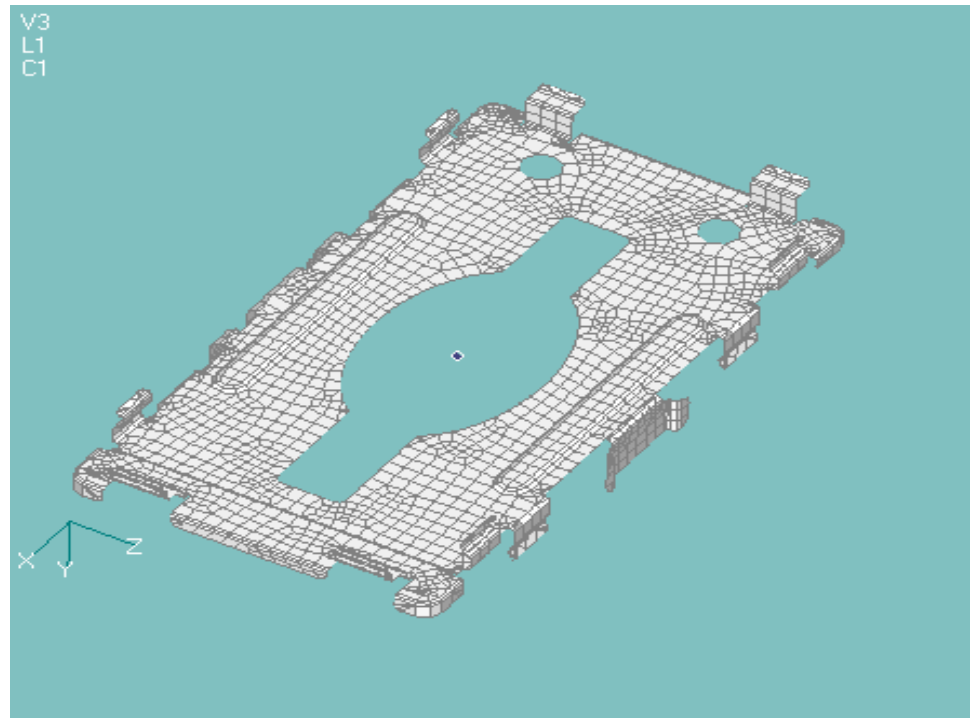
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# INNOVATIVE CONCEPT IN MILITARY PACKAGING APPENDIX



**Pro/E Interlock Model**



**Finite Element  
Mesh**

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